UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/960,508	09/24/2001	Ralph W. Bennett		7228

7590 03/27/2003

J. WILEY HORTON, ESQUIRE
Pennington, Moore, Wilkinson, Bell & Dunbar, P.A.
Post Office Box 10095
Tallahasse, FL 32302-2095

EXAMINER	
YAM, STEPHEN K	
ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 03/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/960,508	BENNETT ET AL.
	Examiner	Art Unit
	Stephen Yam	2878

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 12/30/02 .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-18 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-18 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

This action is in response to Amendments and remarks filed on December 30, 2002. Claims 1-18 are currently pending.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2, and 10 are rejected under 35 U.S.C. 102(b) as being unpatentable by Yoshimura et al. US Patent No. 5,111,056.

Regarding Claim 1, Yoshimura et al. teach (see Fig. 3) a device for determining the distance from a fixed position to a plurality of points on the surface of a target object (9) comprising:

a. a laser (11), positioned proximate said fixed position;

b. a video camera (18), positioned proximate said laser, and fixed in position with respect to said laser, wherein a beam projected by said laser and the field of view of said video camera lie approximately in a first plane (horizontal plane);

c. an oscillating mirror (12), positioned proximate said laser and said video camera, reflecting said beam projected by said laser and said video camera field of view out toward said target object such that reflected beam and reflected field of view fall upon said target object (see Fig. 3);

d. wherein said reflected beam projected by said laser and said reflected field of view of said video camera lie approximately in a second plane (vertical plane);

e. wherein said laser, said video camera, and said oscillating mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane (see Fig. 3);

f. measurement means (see Col. 5, lines 1-10) capable of accurately measuring the position of said impact point within said field of view of said video camera;

g. computation means (see Col. 5, lines 10-18) for calculating the distance from said fixed position to said impact point on the basis of said measured position of said impact point within said field of view of said video camera; and

h. wherein said oscillating mirror oscillates in a controlled fashion (see Col. 5, lines 1-7, 10-13, and 19-25) so as to sweep said beam of said laser and said field of view of said camera across said target object while maintaining said impact point within said field of view of said video camera, so as to permit the computation of distances (see Col. 5, lines 10-18) for a plurality of said impact points on said target object.

Regarding Claim 2, Yoshimura et al. teaches said video camera as a line scan camera (see Col. 4, lines 66-68 and Fig. 3).

Regarding Claim 10, Yoshimura et al. teach (see Fig. 3) a device for determining the distance from a fixed position to a plurality of points on the surface of a target object (9) comprising:

a. a common mirror (12);

b. a laser (11), positioned so as to direct a beam upon said common mirror and from thence out to said target object;

c. a camera (18), offset a set distance from said laser, and positioned so as to view the impact point (on (9)) of said beam upon said target object through its reflection in said common mirror (see Fig. 3);

d. wherein said beam from said laser and said field of view of said camera lie approximately in a first plane (horizontal plane);

e. wherein said reflected beam projected by said laser and said reflected field of view of said camera lie approximately in a second plane (vertical plane);

f. wherein said laser, said camera, and said common mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane (see Fig. 3);

g. means for oscillating (see Col. 5, lines 1-7, 10-13, and 19-25) said common mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving the field of view of said camera in unison with said impact point so that said impact point is always within said field of view of said camera;

h. means for measuring (see Col. 5, lines 1-10) the position of said impact point within said field of view of said camera; and

i. computation means (see Col. 5, line 10-18) for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point within said field of view of said camera.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 3, 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura et al.

Regarding Claim 3, Yoshimura et al. teach the device as taught in Claim 1, according to the appropriate paragraph above. Yoshimura et al. also teach (see Col. 5, lines 10-18) capturing multiple data points to provide a profile of the object surface along the scanned points. Yoshimura et al. do not teach memory storage means to record a plurality of computed distance measurements in order to build a mathematical profile of said target object. It is well known in the art to use memory as a storage medium for retaining previously accumulated data, and that some form of storage means is used to store the final profile. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include memory storage means to record the data points in the device of Yoshimura et al., to retain all data points to retain all information about the generated profile.

Regarding Claim 7, Yoshimura et al. teach (see Fig. 3) a device for determining the distance from a fixed position to a plurality of points on the surface of a target object (9) comprising:

a. a laser/camera mirror (12);

b. a laser (11) positioned so as to direct a beam upon the mirror and from thence out to said target object;

c. a camera (18) positioned so that the field of view of said camera falls upon said mirror and the reflected field of view of said camera falls upon said target object;

d. wherein said beam projected by said laser and said field of view of said camera lie approximately in a first plane (horizontal plane);

e. wherein said reflected beam projected by said laser and said reflected field of view of said camera lie approximately in a second plane (vertical plane);

f. wherein said laser, said camera, and said mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane (see Fig. 3);

g. means (see Col. 5, lines 1-7, 10-13, and 19-25) for oscillating the mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object;

h. means (see Col. 5, lines 1-10) for measuring the position of said impact point within said field of view of said camera; and

i. computation means (see Col. 5, lines 10-18) for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point within said field of view of said camera.

Yoshimura et al. do not teach a separate laser mirror and camera mirror offset a set separation distance from the laser mirror and linked to said laser mirror so as to move in unison with said laser mirror. It is design choice to include two separate mirrors instead of a single common mirror. It would have been obvious to one of ordinary skill in the art at the time the invention was made to separate the mirror into a laser mirror and camera mirror in the device of

Yoshimura et al., to allow easier and more economical replacement of a mirror in the event of damage to a single mirror.

Regarding Claim 8, Yoshimura et al. teaches the device as taught in the preceeding paragraph with respect to Claim 7. Yoshimura et al. also teach (see Col. 5, lines 10-18) capturing multiple data points to provide a profile of the object surface along the scanned points. Yoshimura et al. does not teach memory storage means to record a plurality of computed distance measurements in order to build a mathematical profile of said target object. It is well known in the art to use memory as a storage medium for retaining previously accumulated data, and that some form of storage means is used to store the final profile. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include memory storage means to record the data points in the device of Yoshimura et al., to retain all data points to retain all information about the generated profile.

3. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura et al. in view of Nakagawa et al. US Patent No. 4,553,844.

Regarding Claims 4 and 5, Yoshimura et al. teach (see Fig. 3) a device for determining the distance from a fixed position to a plurality of points on the surface of a target object (9) comprising:

a. a laser (11), positioned proximate said fixed position, with its beam not directed towards said target object;

b. a video camera (18), positioned proximate said laser, and fixed in position with respect to said laser, wherein a beam projected by said laser and the field of view of said video camera lie approximately in a first plane (horizontal plane);

c. a mirror (12), positioned as to reflect said beam and said camera field of view out towards said target object, so that said reflected beam creates an impact point (16) on said target object which falls within said reflected field of view of said camera, and so that an oscillation of said oscillating shaft causes the oscillation of said mirror, thereby causing said impact point and said camera field of view to sweep across said target object in synchronization;

d. wherein said reflected beam projected by said laser and said reflected field of view of said video camera lie approximately in a second plane (vertical plane);

e. wherein said laser, said video camera, and said oscillating mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane (see Fig. 3);

i. measurement means (see Col. 5, lines 1-10) capable of accurately measuring the position of said impact point within said field of view of said video camera; and

f. computation means (see Col. 5, lines 10-18) for calculating the distance from said fixed position to said impact point on the basis of said measured position of said impact point within said field of view of said video camera.

Regarding Claim 5, Yoshimura et al. also teach the video camera as a line-scan camera (see Col. 4, lines 66-68 and Fig. 3). Yoshimura et al. do not teach a galvanometer with an oscillating shaft proximate to said laser to obstruct the path of said beam and said field of view of said video

camera, or a mirror attached to the shaft. Nakagawa et al. teach (see Fig. 4) a device with a laser (15), video camera (21), galvanometer (under 18) (see Col. 4, lines 45-48) with a shaft (under 18) proximate to said laser to obstruct the path of said beam and said field of view of said video camera, and a mirror (18) attached to the shaft. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a galvanometer as taught by Nakagawa et al. to rotate the mirror of Yoshimura et al., to utilize commonly-known device for rotating a mirror, for simpler design and construction of the device.

Regarding Claim 6, Yoshimura et al. teach the device as taught in Claim 5, according to the appropriate paragraph above. Yoshimura et al. also teach (see Col. 5, lines 10-18) capturing multiple data points to provide a profile of the object surface along the scanned points. Yoshimura et al. do not teach memory storage means to record a plurality of computed distance measurements in order to build a mathematical profile of said target object. It is well known in the art to use memory as a storage medium for retaining previously accumulated data, and that some form of storage means is used to store the final profile. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include memory storage means to record the data points in the device of Yoshimura et al., to retain all data points to retain all information about the generated profile.

4. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura et al. in view of Cantor US Patent No. 4,198,164.

Yoshimura et al. teaches the device as taught in the preceding rejection of Claim 8. Yoshimura et al. do not teach the target object moving past the laser mirror in a controlled

fashion and wherein the linear motion of said target object is sensed by sensing means so that a plurality of said mathematical profiles of said target object can be computer, thereby allowing the computation of a full surface mode. Cantor teaches (see Fig. 1) a distance measurement device with a laser (13, 14) directed on a target object (1), a camera (12) to view the impact point of the laser, means for measuring (27) the position of said impact point within said impact point within said field of view of said camera, and computation means (see Col. 4, line 50 to Col. 5, line 4) for calculating the distance from the camera to the impact point using the set separation distance and the position of the impact point within the field of view of the camera. Cantor also teaches the laser and camera mounted on a housing (10) and the controlled movement of the target object relative to the housing (see Col. 2, lines 46-48 and Col. 9, lines 1-3)- hence, in the view of the camera, the target object is moved past the camera. It is design choice whether the target object is moved relative to the camera or the camera is moved relative to the target object, and such a decision does not affect the operation and performance of the device. Inherently, the precise calibrated motion involved in the device of Cantor requires a linear motion sensing means such as a speedometer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to move the target object past the laser mirror in a controlled fashion wherein the linear motion of said target object is sensed by sensing means so that a plurality of said mathematical profiles of said target object can be computer, allowing the computation of a full surface mode in the device of Yoshimura et al. in view of Cantor, to provide additional flexibility in scanning various surface points in the longitudinal direction to obtain a complete three-dimensional profile of the target object as desired by Yoshimura et al. (see Col. 5, lines 16-18).

5. Claims 11-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rioux US Patent No. 4,627,734.

Regarding Claims 11, 12, and 14-18, Rioux teaches (see Fig. 6) a device for determining the distance from a fixed position to a plurality of points on the surface of a target object (9) comprising:

g. a common mirror (M6);

h. a splitting mirror (M3) having a first and second angled side;

i. a projector mirror (M5) offset a set distance from said first angled side of said splitting mirror;

j. a receiver mirror (M4) offset a set distance from said second angled side of said splitting mirror;

k. a laser (S) positioned so as to direct a beam upon said common mirror, first angled side of said splitting mirror, and projector mirror, and out to said target object;

l. a camera (D) offset a set distance from said laser and positioned so that the field of view of said camera falls upon said common mirror, second angled side of said splitting mirror, receiver mirror, and said target object;

m. wherein said beam from said laser and said field of view of said camera lie approximately in a first plane (horizontal plane);

n. wherein said reflected beam projected by said laser and said reflected field of view of said camera lie approximately in a second plane (vertical plane);

o. wherein said laser, said camera, and said common mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane (see Fig. 6);

p. means for oscillating (see Col. 5, line 63 to Col. 6, line 2) said common mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving the field of view of said camera in unison with said impact point so that said impact point is always within said field of view of said camera;

q. means for measuring (see Col. 4, lines 14-17) the position of said impact point (P1) within said field of view of said camera; and

r. computation means (see Col. 4, lines 17-21) for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point within said field of view of said camera.

Regarding Claim 12, Rioux teaches the camera as a line scan camera (see Col. 5, lines 27-37). Regarding Claim 14, Rioux teaches the beam projected by said laser and said camera field of view as approximately parallel (see Fig. 6). Regarding Claim 15, Rioux teaches (see Fig. 4) the distances between each of the subsequent components in the optical path as approximately equal. Regarding Claim 16, Rioux teaches (see Fig. 4-6) the camera and laser mounted closely together and minimizing vibration-induced error (see Col. 1, lines 29-31). Regarding Claim 17, Rioux teaches (see Fig. 4-6) the camera, laser, and common mirror mounted closely together and minimizing vibration-induced error (see Col. 1, lines 29-31). Regarding Claim 18, Rioux teaches (see Fig. 4-6) the camera, laser, common mirror, and splitting mirror mounted closely together and minimizing vibration-induced error (see Col. 1, lines 29-31). Rioux does not teach

the laser beam first projected upon the common mirror, then the splitting mirror, then the projector mirror, or the field of view of the camera first falling upon the common mirror, then the splitting mirror, then the receiver mirror. It is design choice as to where the components are placed and which component the laser beam or the camera's field of view initially or subsequently encounter- multiple configurations provide the same device-configurability and characteristics of the specific arrangement as claimed. It would have been obvious to one of ordinary skill in the art at the time the invention was made to arrange the common mirror, splitting mirror, and projector mirror to reflect the laser beam and camera field of view as claimed in the device of Rioux, to arrange the mirrors as desired in order to save space or to fit the arrangement in a particular pre-defined enclosure or housing.

Regarding Claim 13, Rioux teaches the device as taught in Claim 11, according to the appropriate paragraph above. Rioux also teach (see Col. 5, lines 63-66) capturing multiple data points to provide a profile (see Abstract, lines 1-4) of the object surface along the scanned points. Rioux does not teach memory storage means to record a plurality of computed distance measurements in order to build a mathematical profile of said target object. It is well known in the art to use memory as a storage medium for retaining previously accumulated data, and that some form of storage means is used to store the final profile. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include memory storage means to record the data points in the device of Rioux, to retain all data points to retain all information about the generated profile.

Response to Arguments

6. Applicant's arguments with respect to claims 1-11 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Yam whose telephone number is (703)306-3441. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (703)308-4852. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7724 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

SY

SY
February 27, 2003

DAVID PORTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800